

REMARKS

Claims 16-19, 21 and 22 are canceled; non-elected method claims 3, 4, 10-15, 20 and 23-25 are withdrawn; and new dependent claims 26-29 have been added. No new matter was added. Accordingly, claims 1, 2 and 26-29 are pending for prosecution in the present application. Applicant submits arguments and Terminal Disclaimers for overcoming the rejections of independent claim 1 over the prior art of record. Therefore, Applicant respectfully submits that the present application is in condition for allowance.

I. Restriction Requirement

In the Office Action, restriction is required between Group I (claims 1 and 2) directed to a sputtering target or thin film and Group II (claims 3-25) directed to a method of making high purity hafnium.

Applicant confirms the election of GROUP I, claims 1 and 2. New dependent claims 26-29 are directed to a sputtering target or thin film of GROUP I.

New claim 26 has been added to clarify the conventional practice that the purity of the hafnium material is determined without consideration of zirconium content. For example, this is stated repeatedly in the prior art reference cited by the Examiner in the Office Action. Also, see page 4, line 24, of the present application, as filed, which states: "This hafnium raw material, excluding zirconium, has a purity level of 3N". No new matter was added.

The subject matter of new claim 27 is disclosed in Example 1 of the present application on page 6, line 21. The subject matter of new claim 28 is disclosed in Example 3 of the present application on page 8, line 3. The subject matter of new claim 29 uses the purity level of Example 1 as a lower limit and the purity level of Example 3 as the upper limit. No new matter was added.

The withdrawn non-elected method claims 3, 4, 10-15, 20 and 23-25 remain in the application for rejoinder. The method claims have been amended to include all the limitations of claim 1, and should claim 1 be allowed, Applicant respectfully requests rejoinder of the withdrawn method claims.

II. Claim Rejections - 35 USC §103(a)

In the Office Action, claims 1 and 2 are rejected under 35 USC §103(a) as being obvious over U.S. Patent Application Publication No. 2003/0062261 A1 of Shindo.

Independent claim 1 of the present application requires “a sputtering target or thin film made of a high purity hafnium material, wherein a zirconium content of the target or thin film is 1 to 1000wtppm”. In the Office Action, the above cited application publication of Shindo is interpreted as disclosing this limitation. More specifically, the Office Action states:

“... Shindo further teaches that the zirconium content of the high purity hafnium material should be 0.5 wt% (5000 wt ppm) or less (claim 1). The disclosed zirconium content thus overlaps the range claimed in claim 1 of the instant application and establishes a *prima facie* case of obviousness with Shindo (See MPEP 2144.05, para I: In the case where the claimed ranges ‘overlap or lie inside ranges disclosed by the prior art’ a *prima facie* case of obviousness exists).”

Applicant respectfully disagrees with this interpretation of the cited reference and respectfully requests reconsideration for the reasons set forth below. More specifically, Applicant respectfully submits that the range of zirconium content fairly disclosed and enabled by the prior art reference does not overlap or obviate the range required by claim 1 of the present application.

The cited prior art reference, U.S. Patent Application Publication No. 2003/0062261 A1 of Shindo, corresponds to U.S. Patent No. 6,861,030 B2 issued to Shindo (which was cited in

Applicant's previously filed Information Disclosure Statement). Yuichiro Shindo, the inventor of the present application, is the inventor of the invention disclosed in the cited application publication and above referenced issued patent. Nippon Mining and Manufacturing Co., Ltd. is the assignee of the present application and the cited reference. Thus, Applicant is well aware of the cited reference and its disclosure.

The cited reference discloses high purity hafnium having a 4N (99.99%) level excluding zirconium and gas components such as oxygen and carbon. See, for instance, Paragraph No. 0133 of the cited application publication. The purity of the hafnium in the cited reference clearly excludes zirconium as an impurity.

Applicant respectfully requests the Examiner to consider the following statements in Paragraph Nos. 0061 and 0065 of the cited published application, which read as follows:

“[0061] ... a large quantity of zirconium is contained in hafnium, and notwithstanding the fact that the separation and refinement between the two is difficult, this may be *disregarded* since the purpose of use of the respective materials *will not hinder* overall purpose hereof.”

“[0065] It is *extremely difficult to reduce* Zr in high purity hafnium ... the fact that Zr is mixed in high-purity hafnium *will not aggravate* the properties of semiconductors, and *will not be a problem*.”

These statements are consistent with the statement made in the present application, as filed, on page 1, lines 14-18, with respect to the background art. However, unlike the prior art reference which simply “disregards” and accepts the presence of zirconium as not aggravating properties or being a problem, the present invention is specifically directed to a high purity hafnium material having greatly reduced zirconium content; because, according to the present invention, zirconium content does aggravate properties and is a problem.

Thus, the cited prior art reference “teaches away” from the present invention in that it accepts zirconium content and states that it is not a problem. In the present application, the

presence of too great an amount of zirconium is a problem, and it is not simply disregarded and accepted.

An "Example 2" disclosed in Paragraph Nos. 0082-0095 of the cited prior art reference discloses a hafnium raw material containing 25,000 ppm of zirconium. (See page 5, Paragraph No. 0088, Table 3, of the cited reference.) Page 5, Paragraph No. 0089, Table 4, of the cited reference discloses that, after the hafnium material is purified, it contains 3,500 ppm of zirconium. On Paragraph No. 0095 of the cited application publication, it is stated that:

"[0095] As shown in Table 4 above, the zirconium contained in hafnium is generally of a high concentration, but the zirconium was reduced to approximately 1/7 of the raw material; that is, to 3500 ppm."

Also, see "Example 2" disclosed in Paragraph Nos. 0120-0134 of the cited prior art reference. In particular, see Tables 3 and 4 on pages 7 and 8 of the cited prior art application publication which discloses a hafnium raw material having 25,000 ppm of zirconium and a purified hafnium material having 2,400 ppm of zirconium.

Accordingly, a fair interpretation of the enabled disclosure provided by the cited prior art application publication is that zirconium content can be reduced in a purified hafnium material to as low as 3500ppm, 2400ppm, or by approximately one-seventh of the original zirconium content in a raw hafnium material containing 25,000 ppm Zr. Thus, the meaning of "or less" in the phrase "0.5% or less" is clearly defined in the cited prior art published application to mean 3500ppm, 2400ppm, or approximately one-seventh of the zirconium content in a raw hafnium material containing 25,000 ppm Zr. There is no enabling disclosure for any value of zirconium content in a purified hafnium material below 2400ppm Zr.

Thus, Applicant respectfully submits that upon careful and proper interpretation of the cited prior art application publication, the range of zirconium content (1 to 1,000 ppm) required

by claim 1 of the present application does not overlap or lie within the range of zirconium content (no lower than 2400ppm) fairly taught and enabled by the cited reference.

Further, the cited reference clearly states that the zirconium content of 2,400 ppm or 3,500 ppm in the purified hafnium material can be “disregarded” since it neither aggravates properties nor causes a problem. Thus, one of ordinary skill in the art is taught by the cited reference that the “or less” language refers to 3500ppm, 2400ppm, or approximately one-seventh of the zirconium content in a raw hafnium material containing 25,000 ppm Zr and that at such levels the zirconium content can simply be disregarded as not being a problem. Accordingly, there is no common sense reason for one of ordinary skill in the art to further reduce zirconium content based on the teachings of the cited reference, and there is no fair and enabling teaching of how to accomplish such a reduction.

For the above reasons, Applicant respectfully submits that claim 1 of the present application is not obviated by the cited reference. Simply stated, the cited reference fails to disclose or motivate one of ordinary skill in the art to reduce zirconium content to less than 2400 ppm which is well above that required by claim 1 of the present application. Applicant respectfully requests reconsideration and removal of the rejection.

III. Claim Rejections – Double Patenting

A. In the Office Action, claims 1 and 2 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1 and 3-5 of co-pending application No 11/994,167 in view of U.S. Patent Application Publication No. 2003/0062261 A1 of Shindo.

A Terminal Disclaimer is being filed with respect to co-pending application No. 11/994,167. Accordingly, Applicant respectfully requests reconsideration and removal of the rejection.

B. In the Office Action, claims 1 and 2 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1 and 2 of co-pending application No 10/595,660 in view of U.S. Patent Application Publication No. 2003/0062261 A1 of Shindo.

A Terminal Disclaimer is being filed with respect to co-pending application No. 10/595,660. Accordingly, Applicant respectfully requests reconsideration and removal of the rejection.

IV. Conclusion

In view of the above amendments, remarks, and Terminal Disclaimers, Applicant respectfully submits that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to
our deposit account no. 08-3040.

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